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LINX TECHNOLOGIES

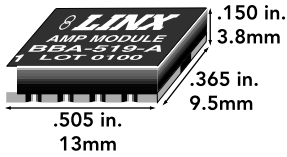
WIRELESS MADE SIMPLE

BBA-322-A
BBA-519-A

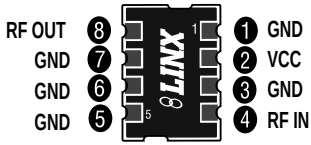
GENERAL-PURPOSE BROADBAND RF AMPLIFIER DATA GUIDE

DESCRIPTION:

The BBA series is a family of low-cost high-performance broadband RF amplifiers. The modules are ideally suited to a wide range of amplification and buffering applications including extending the range of Linx's own RF modules (when legally appropriate). Housed in a compact SMD package, the hybrid amps are prematched to 50Ω source and load impedances and require no external RF components. The modules utilize a GaHBT gain stage which yields high gain and IP3, excellent flatness and low noise.



PHYSICAL DIMENSIONS



PINOUTS (BOTTOM VIEW)

ALL BBA AMPS FEATURE:

- Prematched for 50Ω Impedance I/O
- No External RF Components Required
- Exceptional Gain Flatness
- Compact Surface-Mount Package (for easy hand or automated mounting)

BBA-322 FEATURES:

- High Gain Model
- 10 Mhz-3 Ghz Broadband Operation
- +20dB Small Signal Gain @ 900MHz
- Up to +10 (10mW) Linear Output Power
- 3.8 dB Noise Figure
- Operates From a Single Supply

BBA- 519 FEATURES:

- High Output Model
- 10 Mhz-4 Ghz Broadband Operation
- +18dB Small Signal Gain @ 900MHz
- Up to +17 (50mW) Linear Output Power
- 4.8 dB Noise Figure
- Operates From a Single Supply

APPLICATIONS INCLUDE:

- TX/RX Range Enhancement*
- IF or RF Buffering
- Driver or Final Stage for PA
- General-Purpose Gain Blocks

ORDERING INFORMATION

PART #	DESCRIPTION
BBA-322-A	Hi-Gain RF Amp
BBA-519-A	Hi-Power RF Amp

BBA Amplifiers are supplied in tube packaging - 50 pcs. per tube.

Revised 1/26/01

PERFORMANCE DATA – BBA-519-A

Parameters BBA-519-A	Rating	Unit
Supply Current	**120**	**mA**
Input RF Power	**+13**	**dBm**
Environmental Operating Temp.	**-40 to +85**	**°C**
Storage Temp.	**-60 to 150**	**°C**

ABSOLUTE MAXIMUM RATINGS

These ratings are intended to indicate the limits past which device damage may occur. Operation of the device at these limits is not suggested or guaranteed.

TYPICAL OPERATING PARAMETERS

All parameters measured @ 5.2 Volts, 25°C, -30dBm input

Parameters BBA-519-A	Typical	Units	Notes
Frequency Range	10 to 4000	MHz	T=25°C, I_{cc}=65mA
Gain	18	dB	Freq=100MHz
	17	dB	Freq=1000MHz
	15	dB	Freq=2000MHz
	13	dB	Freq=3000MHz
	12	dB	Freq=4000MHz
Gain Flatness	±2	dB	100MHz to 2000MHz
Noise Figure	4.8	dB	Freq=2000MHz
Input VSWR	2.1:1		In a 50Ωsystem, DC to 4000MHz
Output VSWR	1.8:1		In a 50Ωsystem, DC to 4000MHz
Output IP_3	+33	dBm	Freq=1000MHz±50KHz, P_{TONE}=-10dBm
Output P_{1dB}	+18.5	dBm	Freq=1000MHz
Reverse Isolation	20	dB	Freq=2000MHz
Power Supply			
Device Operating Voltage	4.8-5.2	VDC	VCC regulated between 4.8 and 5.2VDC
	5.2-12	VDC	VCC Range using appropriate current limiting resistor inline with VCC
Operating Current	60	mA	@5VDC
Environmental			
Rated Operating Temperature	0-70	°C	

PERFORMANCE DATA – BBA-322-A

Parameters	Rating	Unit
Supply Current	**65**	**mA**
Input RF Power	**+15**	**dBm**
Environmental Operating Temp.	**-40 to +85**	**°C**
Storage Temp.	**-60 to 150**	**°C**

ABSOLUTE MAXIMUM RATINGS

These ratings are intended to indicate the limits past which device damage may occur. Operation of the device at these limits is not suggested or guaranteed.

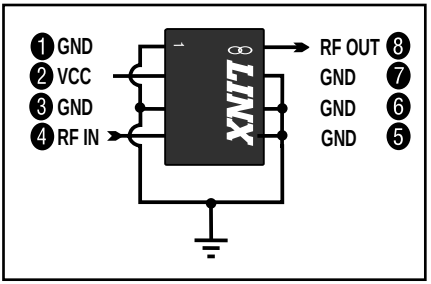
TYPICAL OPERATING PARAMETERS

All parameters measured @ 5 Volts, 25°C, -50dBm input

Parameters BBA-322-A	Typical	Units	Notes
Frequency Range	DC to 3000	MHz	T=25°C, I_{cc}=35mA
Gain	21	dB	Freq=100MHz
	20	dB	Freq=1000MHz
	17	dB	Freq=2000MHz
	14	dB	Freq=3000MHz
Gain Flatness	±2	dB	100MHz to 2000MHz
Noise Figure	3.8	dB	Freq=2000MHz
Input VSWR	2.3:1		In a 50Ωsystem, DC to 3000MHz
Output VSWR	2.1:1		In a 50Ωsystem, DC to 3000MHz
Output IP3	+22.5	dBm	Freq=2000MHz±50KHz, P_{TONE}=-18dBm
Output P1dB	+11.2	dBm	Freq=2000MHz
Reverse Isolation	20	dB	Freq=2000MHz
Power Supply			
Device Operating Voltage	4.8-5.2	VDC	VCC regulated between 4.8 and 5.2VDC
	5.2-12	VDC	VCC Range using appropriate current limiting resistor inline with VCC
Operating Current	35	mA	@ 5VDC
Environmental			
Rated Operating Temperature	0-70	°C	

PIN DESCRIPTIONS:

Pin 1,3,5,6,7	**GROUND**	Ground Connection. Keep traces short and connect immediately to ground plane for best results.
Pin 2	**VCC**	VCC Positive Supply Voltage. Read the Power Supply Considerations section of this manual carefully to avoid permanent device damage
Pin 4	**RF IN**	RF input pin. This pin is internally DC blocked.
Pin 8	**RF OUT**	RF output. This pin is internally DC blocked.



*IMPORTANT NOTE:

The purchaser of this device should be aware that approvals may be required by applicable governing bodies for systems producing RF energy. It is the responsibility of the user to determine and adhere to the appropriate regulations for the region in which operation is intended.

OPERATIONAL CONSIDERATIONS

The use of a gain stage can produce a significant increase in the range performance of an RF link. It is important to note that it can also introduce detrimental effects such as the following:

- Amplification of harmonics and LO along with the fundamental carrier frequency.
- Adverse effect on front-end noise figure on RX's.
- Potential damage if receiver input is not capable of accommodating high input power levels.
- Risk of generating illegal power levels and unacceptable interference.

POWER SUPPLY CONSIDERATIONS

The user should insure a clean source of power for the amplifier module. In cases where the supply contains excessive noise, a filter and bypass should be placed on the supply line in close proximity to the module.

The power supply must be regulated to within the primary range specified or the maximum current limited using an appropriate resistance in series with the amplifier's positive supply pin. Failure to observe the supply limits will irreparibly damage the device. The resistor should be selected so that the device current is limited to or less than the maximum rated current. The resistor value may be easily selected using the following formula:

$$R = \frac{V_{SUPPLY} - V_{DEVICE\ TYP.}}{I_{CC}}$$

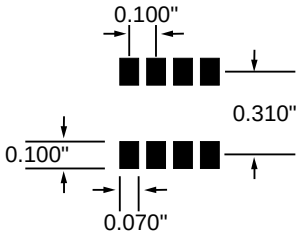
Example:
BBA-519 @ 9 Volt Supply

$$R = \frac{9-5}{60x10^{-3}} = 4 \div .06 = 66\Omega$$

PAD LAYOUT

The pad layout shown below is designed to facilitate both hand and automated assembly.

BBA Pad Layout Pattern
(Not to Scale)



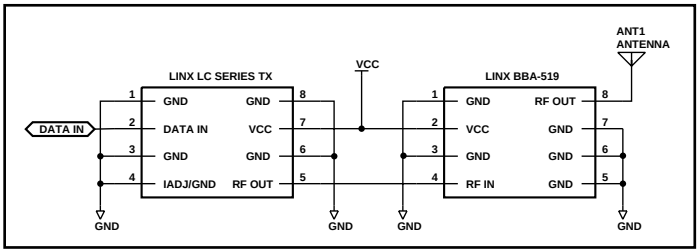
BOARD LAYOUT

If you are at all familiar with RF devices you may be concerned about specialized layout requirements. Hi-gain high-frequency amplifiers are notorious for layout challenges. Thankfully, the BBA series is inherently very stable. By adhering to a few simple design and layout rules you will enjoy a trouble-free implementation.

The module should be placed as close as possible to the transmitter or receiver with which it is to be paired. A ground plane should be placed under the module, usually on the backside of the PCB. RF traces to and from the amp should be kept short and of the proper width to assure service as a 50Ω transmission line. The module's RF ports are AC-coupled and require no matching in a 50Ω system.

TYPICAL APPLICATION:

The schematic below pictures a typical configuration for amplifying the output of a low-cost narrowband transmitter. This configuration would result in a 6-7X increase in system range. Note that such output levels may render the transmitter illegal for operation in certain countries.



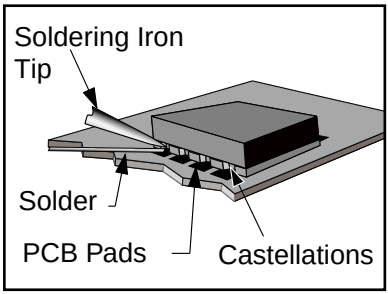
Typical Configuration

PRODUCTION GUIDELINES

The BBA modules are packaged in a hybrid SMD package which has been designed to support hand- or automated-assembly techniques. Since BBA devices contain discrete components internally, the assembly procedures are critical to insuring the reliable function of the BBA product. The following procedures should be reviewed with and practiced by all assembly personnel.

HAND ASSEMBLY

The BBA's primary mounting surface is eight pads located on the bottom of the module. Since these pads are inaccessible during mounting, castellations that run up the side of the module have been provided to facilitate solder wicking to the module's underside. If the recommended pad placement has been followed, the pad on the board will extend slightly past the edge of the module. Touch both the PCB pad and the module castellation with a fine soldering tip. Tack one module corner first, then work around the remaining attachment points, using care not to exceed the solder times listed below.



BBA Soldering Technique

Absolute Maximum Solder Times

Hand-Solder Temp. TX +225°C for 10 Sec.
Hand-Solder Temp. RX +225°C for 10 Sec.
Recommended Solder Melting Point +180°C
Reflow Oven: +220° Max. (See adjoining diagram)

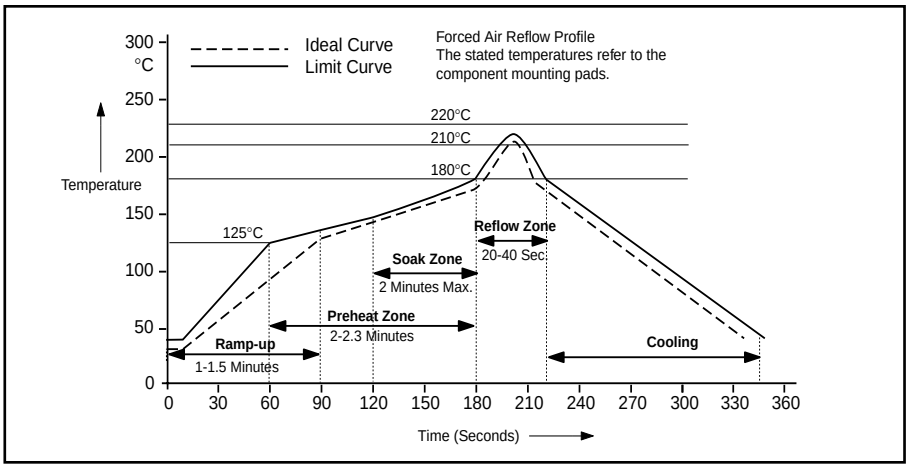
AUTOMATED ASSEMBLY

For high-volume assembly most users will want to auto-place the modules. The modules have been designed to maintain compatibility with most pick-and-place equipment; however, due to the module's hybrid nature, certain aspects of the automated-assembly process are far more critical than for other component types.

Following are brief discussions of the three primary areas where caution must be observed.

Reflow Temperature Profile

The single most critical stage in the automated assembly process is the reflow process. The reflow profile below should be closely followed since excessive temperatures or transport times during reflow will irreparably damage the modules. Assembly personnel will need to pay careful attention to the oven's profile to insure that it meets the requirements necessary to successfully reflow all components while still meeting the limits mandated by the modules themselves.



Required reflow profile

Shock During Reflow Transport

Since some internal module components may reflow along with the components placed on the board being assembled, it is imperative that the module not be subjected to shock or vibration during the time solder is liquidus.

Washability

The modules are wash-resistant, but are not hermetically sealed. They may be subject to a standard wash cycle; however, a twenty-four-hour drying time should be allowed before applying electrical power to the modules. This will allow any moisture that has migrated into the module to evaporate, thus eliminating the potential for shorting during power-up or testing.

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